

# Propulsion System and Second Stage Structural Loads Interaction Test Platform at SSC E3-C2

Completed Technology Project (2017 - 2018)



## Project Introduction

Relativity has a collaborative partnership with NASA's STMD and SSC to further the development of our innovative orbital launch vehicle additive manufacturing technologies through an investigation of 3D printed pressure-fed propulsion system and second stage structural vibration and acoustic load interactions in hotfire testing at SSC test stand E3-C2. This work significantly builds upon existing 3D printed igniter and engine hotfire testing at E3-C2 conducted through Spring 2017 by collecting the first-ever TRL 4 test data on large scale aluminum printed structures. Stennis will aid Relativity in making E3-C2 test facility upgrades including installing a new thrust structure, upgrading facility fluid components, and rerouting fluid propellant lines to the test cell. Relativity will additively manufacture an approximately 6' diameter by 12' tall representative second stage tank structure using our proprietary printing process, as well as printing our 13,000 lbf Aeon 1 LOx/LNG engine using the Powder Bed Laser Melting process. By partnering with Relativity, NASA will be able to permanently upgrade their existing test stand at E3-C2, which also helps facilitate Relativity continuing to develop orbital launcher technologies. Our technology is readily applicable to both commercial and government products that desire quick iteration and innovative cost saving opportunities, and could help support manufacturing and eventual human exploration on the Moon, Mars, and other planets with in-situ resource utilization.

## Anticipated Benefits

Our technology is readily applicable to both commercial and government products that desire quick iteration and innovative cost saving opportunities, and could help support manufacturing and eventual human exploration on the Moon, Mars, and other planets with in-situ resource utilization. These solicitations increase focus on collaborations with the commercial space sector that not only leverage emerging markets and capabilities to meet NASA's strategic goals, but also focus on industry needs. NASA's investments in industry partnerships can accelerate the availability of, and reduce costs for the development and infusion of, these emerging space system capabilities. While developing the technology to enable NASA's next generation of science and human exploration missions, we will grow the economy and strengthen the nation's economic competitiveness.



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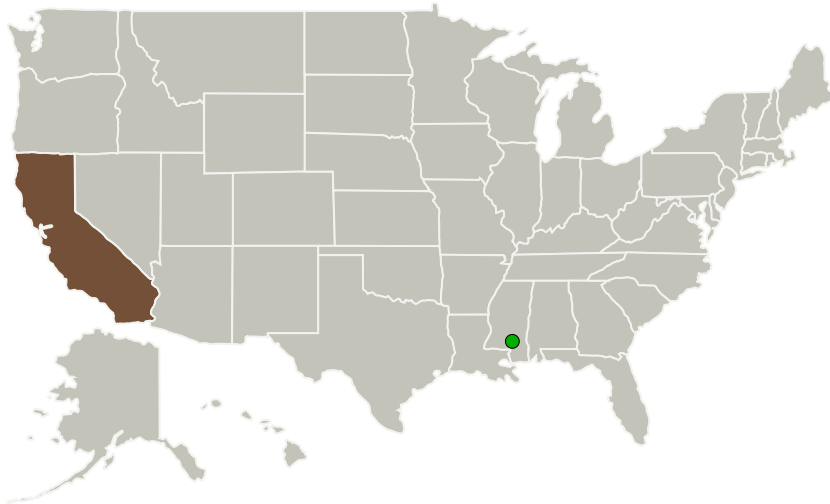
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Relativity Space	Lead Organization	Industry	Los Angeles, California
● Stennis Space Center(SSC)	Supporting Organization	NASA Center	Stennis Space Center, Mississippi

### Primary U.S. Work Locations

California

### Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Relativity Space

### Responsible Program:

Flight Opportunities

## Project Management

### Program Director:

Christopher E Baker

### Program Manager:

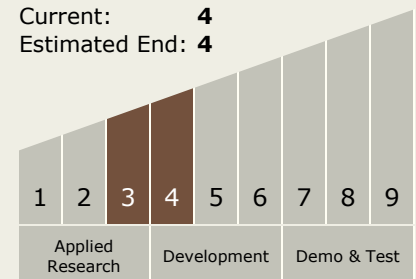
John W Kelly

### Principal Investigator:

Timothy Ellis

## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



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## Target Destination

Earth